

The Ganga Gallery : Science Exhibition on a Socio-Cultural Theme

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Background

"The Ganga, especially, is the river of India, beloved of her people, round which are intertwined her memories, her hopes and fears, her songs of triumph, her victories and her defeats. She has been a symbol of India's age-long culture and civilization, ever changing, ever flowing, and yet ever the same Ganga".

These words and sentiments expressed by Pandit Jawaharlal Nehru, the first Prime Minister of India, in his book 'The Discovery of India' truly reflect the position of the river Ganga in the Indian socio-cultural landscape. From ancient times to the present day, the story of the river from her source to the sea subsumes the story of India's culture & civilization, of the rise and fall of great empires and proud cities, and of human adventures. No other river in the world is possibly so intimately identified with a country and its culture as the Ganga is for India. It is the life-line, a symbol of purity and virtue for millions of people living on its bank and on the land it flows through, representing their ethos, socio-economic culture and techno-scientific practices.

From time immemorial, people of all hues have resorted to the river for purifying their body and soul, for quenching their thirst and that of their crop-producing soil, for performing very many religious rituals, for transportation, and verily for every conceivable function of life. Revering Ganga like a mother deity, succeeding generations have called upon her to make one's day blissful by providing fresh and life giving water. The river occupies a unique position in the cultural ethos of India. Legend says that the river descended from the heavens as a result of the long and arduous prayers of King Bhagirath for the salvation (Moksha) of his deceased ancestors.

Sadly, now the great life-giving river itself, along with the unique ecosystem she nurtured over the entire basin, is severely challenged for survival with her dirty, polluted and scanty remains.

This story of the Ganges, from its glorious days to the modern times, needed to be told once again in order to re-emphasize her importance for India and to sensitize

people towards taking appropriate steps for revival of her past glory.

Project Initiation

With this in view, the National Academy of Sciences, India (NASI), the oldest Science Academy of the country located in Allahabad, decided in 2010 to set up a gallery on Ganga at Allahabad. The idea was mooted by Prof. MGK Menon, Prof. M.S.Swaminathan and Dr.(Mrs) Manju Sharma (Past Presidents of NASI) for creating awareness among the masses for the preservation and conservation of Ganga.



DG, NCSM addressing during the Inaugural Programme.

NASI initially approached Regional Science City, Lucknow and National Science Centre, Delhi Units of NCSM for setting up this gallery at Allahabad and in May 2010 an MOU was signed between NCSM and NASI for setting up the gallery. After finalizing the concept plan in a series of consultations with NASI, it took about eight months of rigorous work for completing the project. The gallery was finally inaugurated on April 15th 2011 by the then Union Science and Technology Minister, Shri Pawan Kumar Bansal.

The project was coordinated by Regional Science City, Lucknow and a unit of the National Council of Science Museums.

Conceptual and Design Challenges

The making of the gallery on the river Ganges with its

socio-cultural and economic significance was a challenging proposition. While on one hand it was necessary to weave a story keeping in mind popular beliefs and sensitivities, portrayal of real issues plaguing the great river's survival today. Also, it was absolutely necessary to tell this story using appropriate media suitable for all classes of visitor's including the experts, the laymen and the faithful.

Thus after a careful consideration of all related aspects of the gallery, an initial concept plan was submitted to NASI covering a total exhibition area of about 3500 sq. ft.. Thereafter, several rounds of discussion and review followed before the final list of exhibits and gallery plan was finalized.

The design of the gallery had to be appropriate to suit the socio-cultural fabric of the storyline. The introduction was done by depicting Ganga as the mother and life-giver to millions of people using an aesthetically crafted idol and diorama.

Since the gallery spread over two floors, the entire exhibition had to be very carefully laid out. It was decided to divide the exhibition into two parts. The exhibition space on the first floor was used to display the exhibits on mythology, landscape, socio-cultural aspect of Ganga, biodiversity of the gangetic basin and the economic influence of the river.



3D AutoCAD plan of the gallery.

The space on the second floor was devoted to portray the current state of affairs of the river from a scientific viewpoint, which include the principal causes of pollution of the holy 'Gangajal', impact on life systems that it supports, issues related to climate change and its implications for the health of the river, and the various other factors affecting the Ganga. Lastly, the exhibition talks about the efforts that are needed to save the river

and about what is being currently done in this regard.

Use of Technology

Because the gallery had to deal with a culturally sensitive scientific issue, it had to be socially appropriate, visually appealing and scientifically correct, while at the same time being very user friendly. This required innovative use of technology for ensuring easy access to information and interpretation services for the visitors.

Touch screen multimedia, RFID supported interactivity with exhibit contents and interactive dioramas and many other technology-based presentation techniques have been used in the gallery to make it easy and exciting to operate as well as engagingly informative.



Use of RFID sensors in exhibits.

The Gallery

On entering the gallery, a Ganga hymn welcomes the visitor and sets the mood for a memorable experience about the river. The myths connected with the river are portrayed by appropriately designed dioramas and supplemented by multimedia presentations. The river Ganga has held India's heart captive and drawn uncounted millions to her banks since the dawn of history. The beliefs and myths associated with the river are presented in the form of a multimedia to help people explore more about them from a cultural perspective.

The source of the river Ganga is a topic of research in itself. A systematic attempt has been made to tell the story of the search of the source in the gallery. Historically, several attempts were made to search for the source of the river. Prior to 10th century, European geographers and cartographers tried to locate the source of the River Ganga on their maps. Jesuit missionaries traveled facing all odds to the lake Mansarovar in the early 17th century and brought back the legend that it was the source of Ganga. Chinese Cartographers too who went to Tibet told the same story. In 1733, it received official recognition after it was published, as part of a four volume description, de l' Empire de la chine and later in James Rennels "Memoir of a Map of Hindustan" in 1783. In 1808, East India Company sent Captain Webb to survey the Ganges from Haridwar to Gangotri (Gaumukh or the Cow's mouth). They gathered reliable information that the source of river is more remote than the place called Gangotri. James Ballie Fraser was the first European to actually reach Gangotri in 1815, followed by Captain J. A. Hodgson two years later, who continued his journey upto Gaumukh and officially discovered the source of Ganga.

The opening of the Ganges in the mountainous gorge at the foot of the Himalayas in Haridwar is also known as Gangadvara. Gangotri is the place from where the Ganges descends. One of the longest glaciers of India, Gangotri glacier's snout descends steeply down 7138 metres from the northwest slopes of Chaukhambha peaks. Bhagirathi, one of the tributaries of the Ganga, originates from the Gaumukh snout of Gangotri glacier, whereas the Alaknanda, the other main tributary emerges from the Bhagirathi Khark and Satopanth glaciers, east of Chaukhambha peaks. After flowing in opposite directions from their respective snouts they meet at Deoprayag and henceforth collectively known as Ganga.

An interactive diorama takes the visitors on a journey to the origin of the Ganges providing scientific information on the glacial ice that feeds the river and associated issues. A specially designed ice-making unit with an opening to let the visitor touch and feel the ice represent the source of the river Ganges.



Ice formation unit installed in one of the exhibit.

Tributaries of Ganga

The interactive exhibit on *Tributaries of Ganga* makes the visitors explore the various tributaries of the river- their sources, travel paths and lengths. It has many tributaries, both in the Himalayan region before it enters the plains at Haridwar and further downstream before its confluence with the Bay of Bengal. The important tributaries and sub - tributaries of Ganga are: Yamuna, Ramganga, Gomti, Gharghara, Gandak, Kosi, Kali / Sharda, Chambal, Sindh, Betwa, Ken, Tons, Sone, Punpun, Damodar & Kangsbatī Haldi. According to Hindu mythology there were about thirty six tributaries of Ganga, some of which are not traceable now.

The Voyage of Ganga

The Voyage of Ganga is an extraordinary journey from the mountains to the ocean. Originating from the Gaumukh in the Himalayas, the river flows through the Sivalik hills and enters the plains at Haridwar. From Haridwar, it flows southwards, meandering over several hundred kilometers in the Indo-Gangetic plains in Uttar Pradesh, Bihar and West Bengal before ultimately joining the Bay of Bengal. Ganga's total path is about 2,525 km long and its basin is spread over approximately 8, 61,404 square km area, which drains almost one fourth of the country. This *voyage of Ganga* is

experienced by the visitors through an interactive multimedia and a visual-seeker technology especially developed for the exhibit.



Prof. MGK Menon interacting with an exhibit.

The water of river - 'Gangajal' - is considered to be sacred and having pristine properties. In Hindu rituals and "Sanskaras", the Gangajal is very important. For example in the Mundan sanskara, a young child is shaven clean with Gangajal; because the water was believed to be so pure in the ancient time that washing the head just after using the razor, was enough to wash out the germs.



Ganga water from past to present.

Scientific reasoning for this ritual has been depicted in the gallery. It has been found that the Gangajal has extraordinary self-purifying abilities because of its high content of dissolved oxygen (DO), extraordinary high rate of re-aeration, long DO-retention abilities, fast assimilation of the putrefiable organic matter, presence of sulphur & radioactive traces, naturally occurring

extracts of medicinal herbs, low temperature gradient at the origin, high flux density & flow, presence of beneficial algal and diatom population, abundance of predatory fauna besides the long duration of sunshine along the Gangetic region has always had its impact (electro-magnetic radiations) on microbial population. Possibly because of these properties, Gangajal had its intrinsic value in Hindu Sanskaras from ages.

Gangajal

The people of India revered and worshipped Ganga due to its purity and extra self-purifying properties and hence the river featured prominently in Indian classics and folklore. The descent of Ganga from heaven to earth has been glorified in great works of Indian art and literature. Many popular movies in India revolve around the mystique of the river, so are many popular songs.

Shaping the Socio-economic & Cultural Landscape

The Ganga basin was so fertile that people living around it could cultivate a variety of crops and with every harvest they used to offer a share to Ganga on whom they were dependent for their livelihood. Gradually these became the mark of their rituals taking shape in many celebrations, pujas, purvas and festivals. The main festivals about and around Ganga are: Kumbh Mela, Sawan Mela, Magha Mela, Kartik Poornima, Ganga Dusshera, Chhath Puja and Ganga Sagar Mela.

The nearby cities along the river Ganga grew into trade centres as navigation along the Ganga was the main source of transportation in ancient India giving rise to interaction and fusion of different trades and cultures such as Varanasi, Paan & Thandai, Madhubani Art & Murshidabad Painting etc. The evolution of sacred complexes along the river Ganga also gave rise to universalization of traditions and made the rich art of this region popular. Some of these are Shehnai, Akharas and Ganga Arti. The fusion of trade, culture and complexes made the priesthood holy and a famous occupation that flourished in several other religious practices and making it a part of our great tradition. Ganga Arti is a special ritual performed at many places on the banks of Ganga on special occasions in which thousands of people participate for worshipping the mother Ganga, their lifeline.



A view of the 2nd floor of the gallery.

An aesthetically designed TV studio set-up in the gallery allows visitors to become a part of the 'Ganga Arti' celebrations at different places and also to take a printout of his photograph virtually standing near the Gomukh, Lakshman Jhula, Varanasi Ghat or Allahabad Sangam. This is one of the most attractive exhibits of the gallery.

Apart from its cultural significance, the river Ganga is the source of livelihood to more than 450 million people living in its basin who are directly or indirectly dependent on the river. The river and its tributaries have supported diverse occupations for the people in areas such as agriculture, power generation, fisheries, transport & tourism, poultry & live-stock farming, pottery, sand-mining, art & craft, several small, medium and large scale industries.

Tourism

The cultural importance of Ganga has also led to development of the tourism industry across the length & breadth of the river. Religious heritage cruising, wildlife cruises featuring with access to a number of national parks, white water rafting, Ganga rallies, floating restaurants etc. are some of the tourism activities that are regularly conducted in and around the river Ganga.

Inland Water Transport

In ancient times the Ganges and some of its tributaries, especially in the east, were important transportation routes. According to the ancient Greek historian

Megasthenes, the Ganges and its main tributaries were being navigated in the 4th century BC. In the 14th century, inland-river navigation in the Ganges basin was still flourishing. By the 19th century, irrigation-cum-navigation canals formed the main arteries of the water-transport system. The advent of paddle steamers revolutionized inland transport and thereby stimulated the growth of indigo production in Bihar and Bengal. Regular steamer services ran from Kolkata up the Ganges to Allahabad and far beyond, as well as to Agra on the Yamuna and up the Brahmaputra River.

Considering the advantages of Inland waterways for movement of bulk cargos like coal, cement, fly ash, food grains and fertilizers, the 1620 km stretch of Ganga between Allahabad & Haldia has been declared as National Waterway I.

The gallery has a RFID sensor-based exhibit that lets the visitors explore about some of the important occupations directly connected with the Ganges. In addition, specially made video films shot at locations like Allahabad, Kanpur, Patna, Haridwar highlights the importance of the Ganga in India's socio-cultural and economic landscape.



A view of the Gangetic ecosystem section of the gallery.

Ecosystems

The Gangetic ecosystem sustains a diverse flora & fauna, which not only help maintain the pristine purity of water, but also serve as a resource for humankind. The river at present nurtures over 140 fish species, 90 amphibian species and five avian zones. The basin is

home for the endangered Ganges dolphin, a rare freshwater shark variety *glyphis gangeticus* besides several species of microorganisms.

However, the Gangetic dolphins today face a number of threats for its survival due to a wide range of human induced disturbances like modification of river flows, change in nutrient and sediment fluxes, water pollution from urbanization, use of chemical fertilizers and pesticides for farming in the river corridor, agriculture, overexploitation of fish resources and poaching of dolphins for oil and meat. Vikramshila Gangetic Dolphin Sanctuary (VGDS), a highly productive 65-km stretch of the lower Ganga River between Sultanganj and Kahalgaon in Bihar, is the only protected area specifically created for saving this endangered river dolphins in India.



Diorama of Sunderbans.

The story of the Gangetic biodiversity would be incomplete without the mention of the Sunderbans, a pristine mangrove swamp at the southern fringe of West Bengal covering 102 islands in the emerald estuarine waters of the tributaries of the Ganga and the Bay of Bengal. The home of the famous Royal Bengal Tiger and one of the largest deltaic ecosystems in the world, importance of Sunderbans is underwritten by the fact that it is in the list of World Natural Heritage Sites (1985) and also is a Biosphere Reserve. The gallery has a specially designed diorama on the Sunderbans with an animated Royal Bengal Tiger. A sensor based switching device coupled with a hydraulic system has been used for making the Tiger model look real-life like.

Science of 'Gangajal'

The second floor of the gallery is devoted to scientific aspects of the river Ganges and its water. For example the physico-chemical and biological properties of water such as Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), pH, temperature, acidity, alkalinity, turbidity, hardness and coliform count have been explained using an interactive multimedia. One can also learn about the permissible limits for each one of these parameters, which are regularly monitored by the central and state pollution control boards.

The multimedia presentation also explains why 'Gangajal' which has been revered through ages because of its unique properties. While flowing through the Himalayan region over different types of rocks, a number of chemical substances get dissolved into the Ganga water. During runoff from its catchment area, the river's water carries many medicinal plants found abundantly in this region which add alkaloid and other useful chemical substances to its water. Ganges water does not putrefy, even after long periods of storage.

The uniqueness of the Ganges water captivated the imagination of people across caste, religion and geographical boundaries. Historical facts and anecdotes have been presented to elaborate these aspects in the gallery. Mughal emperor Akbar's preference for 'the water of immortality' from Ganga for drinking and cooking is described at length in the *Ain-i-Akbari* by Abul Fazl. Bin Tughluq in the year after 1327 carried the Gangajal braving a forty day long journey for his own personal use when he established the new capital of Delhi Sultanate in Daulatabad. British physician, C.E. Nelson observed that Gangajal taken from Hooghly by ships returning to England remained fresh & sweet throughout the voyage. It is also reported that *Bdellovibrio*, a genus of Gram-negative obligate aerobic bacteria, is found in Ganga water which kills bacterial species responsible for decomposing the organic matters present in the water. Ernest Hankin, a British bacteriologist, reported in 1896 on the presence of marked antibacterial activity against *Vibrio cholera* and D'Herelle called it *bacteriophage*. Thus in a way the world owes the discovery of bacteriophages to the Ganges water. In 1896, the

British physician E Hanbury Hankin, reported in the French journal *Annales de l'Institut Pasteur* that cholera microbes died within three hours in Ganga water. A French scientist, Monsieur Herelle, was amazed to find that a sample of the river's water drawn from only a few feet below a floating dead body of a person who had died of dysentery and cholera contained no germs of the disease.

Threats

The watershed of the river Ganga spreads over ten States of India, namely Uttaranchal, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Himachal Pradesh, Rajasthan, Haryana, Madhya Pradesh and Delhi covering 26.2 percent area of India's total geographical area. However, during the past few decades, water of the river has started losing its age-old charm and efficacy due to discharge of huge quantities of untreated city sewage and toxic industrial effluents. The other major reasons for the river's degradation are cremation of dead bodies, agricultural runoff, solid and bio-medical waste disposal, animal bathing, washing of clothes, disposal of temple ritual wastes, extraction of water through lift canals, deforestation in water shade areas, construction of dams in the Himalayan region and large scale urbanization along the river. A multimedia supported with a video film make the visitors ponder over the major threats the holy river is facing today. A diorama of a Sewage Treatment Plant and the supporting multimedia make the visitors understand the process of sewage treatment and how it can be effectively used for saving the Ganga and other rivers.

The environmentally sensitive Indo-Gangetic plain (IGP) is also severely threatened by climate change. The major concerns are fluctuations in precipitation levels and seasonal distribution of river flows, drying up of aquifers, flooding and submergence of low-lying areas including glacial lake outburst flood (GLOF), increase in river bed sedimentation, salt water invasion in freshwater systems, soil salinization etc.

Another important issue is about the dams along the river. The Ganga along with its tributaries and distributaries support a massive network of irrigation channels and a number of hydroelectric projects. The construction of large dams heavily alter the natural

flow of the river affecting every aspect of a river ecosystem including water quality, sediment transport and deposition, fish migrations, riparian and floodplain habitat. The presentations in the gallery open up the question whether the Big Dams are necessary for India. While there are six primary threats faced by the endangered river basins in the world, namely, over-extraction of water, dams & infrastructure, invasive species, climate change, over fishing and pollution, the Gangetic basin suffers most from over-withdrawal of river water and rampant pollution. And both of these are direct consequences of anthropogenic pressures. The Human impact may rob the pristine river its glory and sacredness.



Senior Fellows of NASI interacting with the exhibits.

A collective action from all the stakeholders- the people and the state - is needed to bring Ganga to its original glory. A section of the gallery has been especially devoted to various government initiatives like setting the Ganga Action Plan (GAP) and establishing the National Ganga River Basin Authority (NGRBA) over the years in order to restore the river. The NGRBA is a planning, financing, monitoring and coordinating body for effective abatement of pollution and conservation of the river Ganga in keeping with sustainable development needs.

The gallery ends with the exhibit Ganga Pledge where visitors where visitors can input their pledge for putting life back into the holi Ganga.

Feedback

The gallery since its opening in 2011 has been well received by scientists, scholars, students and common

people. Regular surveys are conducted by NASI to get visitors' feedback of the gallery. The gallery finds a place in the tourist map of Allahabad. That a prototype of the Ganga exhibit was on display at the recently concluded Kumbh Mela for viewing by millions of pilgrims is a testimony that the Ganga gallery has been able to catch public fancy and imaginations.



Dignitaries taking the Ganga Pledge in the gallery.

Conclusion

Handling a crucial socio-cultural theme as sensitive as the River Ganga, treating it from a scientific viewpoint and making an exhibition gallery was a challenging task. One had to be extra cautious not only about the scientific facts and figures but also about dealing with the socio-cultural and religious sensitivity connected with the theme. As the intended target visitors were people from all strata of the society, design of exhibits and presentations had to be commensurate over a range of intellectual and cultural profile. Ease of exhibit operation, interactivity and interpretation demanded careful choice of technology and innovative display techniques. Effective use of dioramas, hands-on interactive exhibits, colourful illustrations/visuals, animations, digital interfaces, multimedia programs and video based presentations made the gallery an enjoyable and learning experience for one and all.

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Selected Readings

1. Agarwal, P. Kumar. *Environment protection and pollution control in the Ganga*, M.D. Publications Pvt. Ltd., 1994.
2. Behera, Sandeep K. *Freshwater & Wetlands Programme*, WWF-India.
3. Cumming, David. *The Ganges Delta and its People*, Thomson Learning, 1994.
4. Darian, Steven G. *The Ganges in myth and history*, Motilal Banarsidass Publ., 2001.
5. Eck, Diana. *Banaras: City of Light*, Routledge & Kegan Paul, London, 1983.
6. Hollick, Julian Crandal. *Ganga: A Journey Down the Ganges River*, Island Press, 2007.
7. Hankin, M. E. *The bactericidal action of the waters of the Jamuna and Ganga rivers on Cholera microbes*, from the translation of original article published in French, Ref. Ann de l'Inst. Pasteur, 10, 511, 1896.
8. <http://cpcb.nic.in/ngrba/about.html>
9. <http://envfor.nic.in/modules/recent-initiatives/NGRBA/index.html>
10. <http://gangapedia.iitk.ac.in>
11. <http://moef.nic.in>
12. Jain, S. K., Agarwal, P. K. and Singh, V. P. *Hydrology and Water Resources of India*, Springer, The Netherlands, 2007.
13. Kishore, Kaushal. *The Holy Ganga*, Rupa & Co., 2008.
14. Murti, C. R. Krishna. *The Ganga: A scientific study*, Northern Book Centre, 1991.
15. Nautiyal, C.S. *Scientific validation of incorruptible self-purificatory characteristic of Ganga Water*, Asian Agri-History 13 (1), 2009.
16. Parua, P. K. *The Ganga in Mythologies, The Ganga Water Science and Technology Library*, Volume 64, 2009.
17. Parua, P. K. *The Ganga: Water Use in the Indian Subcontinent*, Springer, 2009.
18. Report on utilization of funds and assets created through Ganga action plan in states under Gap, A report prepared for the Supreme Court by Member (water resources), Planning commission, Environment & forests division and Water resources division, Planning commission, GOI, May 2009.

19. *River and Flood plain Fisheries in the Ganges Basin*, Final Report, Marine Resources Assessment Group Ltd, Overseas Development Administration, 1996.
 20. Saini H. S., *Climate Change and its Future Impact on the Indo-Gangetic Plain (IGP)*, e-Journal Earth Science India, Vol. I (III), (<http://www.earthscienceindia.info/>)
 21. Sharma, Bharat R. Amarasinghe Upali A, Sikka Alok, Indo-Gangetic River Basins: Summary Situation Analysis, 2008.
 22. Shrivastava V.K. *Commercial Activities and Development in the Ganga Basin*, Concept Publishing Company (p) Ltd., 1999.
 23. Status of Sewage Treatment Plants in Ganga Basin, Publication by Central Pollution Control Board, New Delhi (<http://cpcb.nic.in/>).
 24. Status Paper on river Ganga, *State of Environment and Water Quality*, National River Conservation Directorate Ministry of Environment and Forests Government of India, August, 2009.
 25. *Why the Ganges must be saved*, article published in TIME, 19 July 2010.
 26. Working Paper on *Water, Climate Change, and Adaptation Focus on the Ganges River Basin*, by Nicholas Institute for Environmental Policy Solutions, Duke University, August 2009.
 27. Working with communities to conserve the Ganges river dolphin and the ecosystem, INDIA, at Species / Freshwater fact sheet, www.panda.org/species, a WWF publication.
- World's top 10 rivers at risk at www.panda.org/freshwater



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